On the Genus Trogloderus Le Conte (Coleoptera: Tenebrionidae)

By Ira La Rivers, Nevada Academy of Natural Sciences, Reno, Nevada

The genus *Trogloderus* Le Conte 1879, among other insects, may be likened to some of the weird extinct mammals exemplified by the titanotheres and uintatheres; like them, its members have embarked on that phase of evolutionary growth which seems to characterize any ancient group in the last stages of its existence—they are developing fluidly and rapidly into grotesque caricatures of their plain and drab ancestors. At first glance, to one uninitiated to the group, their deviation from the parent stock would seem of little moment in contrast to the apparently striking growths achieved by more noticeable elements among the scarabs—but among these latter, there are ready links to fit the chain when the group is viewed as a whole, thus reducing the total effect. The differentiation of *Trogloderus* is nearly as pronounced when the staid drabness of their predecessors is taken into account, and while they have not developed such eccentricities as horns, and probably never will, they have achieved a rugosity of prothorax and a costate elytral condition which will compare favorably with the excrescences which, in other animals, have been taken as indications of an explosive growth phase, generally purporting an early extinction of the line. As an additional indication, animals in this stage of evolution, with small exception, appear to have achieved their maximum adjustment to an environment which has for some time been relatively static—and perhaps this final flareup is merely an external expression of somatic flexibility which, unable to produce any variations of value to a system already in equilibrium, continues to exert its influence in meaningless changes in morphology. It is certain, and quite apparent, that in their initial stages such changes are neutral in character; they perform no useful function in adjustment, but seem not to militate against the adjustment. In the final stages even, they may not be of intrinsic importance in any elimina-

tion of the animal from the scene. Probably the greatest operative factor in the death of a line is the changing environment itself. Since all environments change eventually, and often with comparative suddenness, the well-adjusted animal is not able to meet the demands required of it to operate as part of the new flux and succumbs.

Troglodcrus gives further indications of being in the initial phases of this flareup by the state of flux of its members. All subspecies possess pronounced elytral costation with small individual variation, but the rugosity of the prothorax is extremely variable, and almost defies classification. Differentiation has been based exclusively on these prothoracic variations, but they are of such complexity as to present a problem difficult of solution with adults only. There is considerable fieldwork yet to be done before these variations in the imago can be evaluated—however, enough is now known to indicate reliably the extent of these variables, and the chief objective now is to fill in the gaps, obtain the "missing links" of the line and to verify conclusively that which, until now, we have had to relegate to theory in the absence of all the facts.

When the author first reviewed the genus (1942), he added the species *nevadus* to the already described *costatus* and *tuberculatus*. It was evident that *nevadus* was closely allied to *costatus*, but in the absence of truly transitional elements, although the former was represented by an adequate series (14 specimens), there was no alternative but to give *nevadus* specific status, with the reservation that intermediates might be discovered with more extensive collecting. At that time, there were several specimens of undescribed variables in the collection of the California Academy of Sciences which it was not possible to work out, and so they were not included. A recent perusal of these has convinced the author that, in some respects, they show "missing link" characters still sought in the group, and make it possible to crystallize convictions which had hitherto been held only in theory.

The author is deeply indebted to Dr. E. C. Van Dyke for the privilege of examining the specimens of the California Academy of Sciences and for his kind and unstinting aid.

Subfamily Blaptinae

Tribe Elcodiini

Genus **TROGLODERUS** Le Conte

Troglodcrus Le Conte, 1879, North American Entomologist.
Troglodcrus Le Conte & Horn, 1883, Smithsonian Misc. Collections 507.
Troglodcrus Blaisdell, 1909, U. S. N. M. Bulletin 63.
Troglodcrus La Rivers, 1942, Annals Ent. Soc. Am., 1943, P. C. Jour. Ent. & Zool.

The distribution of the genus includes the western half of Nevada, southern California, northwestern Arizona, southwestern Utah, and southern Idaho. *Troglodcrus* was erected to include the first described species, *costatus*. It is peculiar that no specimens have been found in eastern Nevada—*Troglodcri* have been found up to a line which almost exactly bisects Nevada from north to south, but not east of this line; yet their area of distribution curves around southern Nevada into Arizona and Utah. It is probable that they exist in some portions of eastern Nevada and remain to be discovered. Altitudes of collecting localities vary from 900 ft. in southern California to 6,300 ft. at Lake Tahoe, California, and the zonal range is from Lower Sonoran in southern California, Upper Sonoran over most of Nevada and Idaho, and Transition in Nevada and California. The group is primarily an eremophilous one, and is obviously a product of the Great Basin, perhaps much as we know it today, with arenophilous preferences. The most stable subspecies, *tuberculatus*, inhabits the southern limits of the generic range, which is the most static portion, lacking the extremes of temperature prevalent over the northern portions; this and the variable humidities, flora, etc., are reflected in the confusion of variants constituting the remainder of the *costatus* complex. It is also likely, in the case of these latter *costatus* variables, that Pleistocene Lake Lahontan which covered wide areas of west-central and northern Nevada in the geologically-recent past is responsible for much of the variation exhibited. (Geological estimates vary from 10,000 to 50,000 years ago for the last body of water to occupy the Lahontan basin proper,

This ancient inland sea is represented now only by such remnant desert lakes as Pyramid, Walker and the recently-dried Winnemucca, and the vast, white alkali flats known as Deserts or Sinks, stretching for over a hundred miles across northwestern Nevada, and now bearing a thin sheet of water only during the winter and spring rain season, being deserts in the most literal sense of the word during the rest of the year.)

Typical northern *nevadus* has obviously been influenced by the distribution of Lahontan waters. All the author's specimens have been taken within the confines of the old lake itself, while additional specimens are from well within the drainage system supplying the lake. It may be that this preference for the Lahontan system is merely the result of an arenophilous species seeking the best sand dune areas; in this case, the lake itself, which seems to have converted many thousands of tons of surrounding volcanic rock into fine sand along its numerous shores. After final recession of Lahontan, this sand has been gathered here and there, where consistent wind currents prevailed, into aeolian dunes, often of large size and extent, and on these *Trogloderi* have prospered.

Typical *costatus*, the most northern of the complex, is distributed from southern Idaho across north-central Nevada to the mid-eastern edge of California. While it has been found on two sand dune areas, one of which (Paradise Valley) it shared with *nevadus,* it alone of the entire genus, in the author's experience, has been taken in typical Upper Sonoran sagebrush (*Artemisia tridentata*) and Transition pine timber (*Pinus ponderosa jeffreyi*) country. In the vicinity of Reno, it is a common species along the cottonwood (*Populus trichocarpa* and *P. fremonti*) choked Truckee river-bottom, while it has been found at other spots on the eastern face of the humid Sierras, as well as at middle altitudes in the Sierras themselves. It is too early to conjecture on the origin of the group, but their initial invasion of the Sierras at this, the only known point, may have been accomplished by following the Truckee river from its desert mouth to its source in these mountains.

The four new specimens tentatively referred to *nevadus,* and detailed more fully under the discussion of that form, have no

connexion with the Lahontan system and are obviously, although seemingly not now technically separable, of different origin than the northern series. Little can be said of *vandykei* since but one specimen is known.

The author's previous key (1942) is modified below to include the new form, as well as to reflect the present status of those remaining.

1. Pronotum entirely tuberculate on dorsum
costatus tuberculatus
Pronotum reticulate, at least in the center of the disc....(2)
2. Pronotal median foveae deep, distinct, separate
costatus costatus
Foveae absent or faint and connected, appearing as a shallow furrow .....(3)
3. Pronotum entirely reticulate, smoothly rounded on top
costatus nevadus
Pronotum tuberculate along marginal bands, dorsum bilobed on cross-sectional view.....*costatus vandykei*

Trogloderus costatus costatus Le Conte

Trogloderus costatus Le Conte, 1879, N. A. Ent., Jan. 1, p. 3, pl. 1, fig. 3.
Trogloderus costatus Le Conte & Horn, 1883, Smiths. Misc. Colls. 507.
Trogloderus costatus Blaisdell, 1909, U. S. N. M. Bull. 63.
Trogloderus costatus La Rivers, 1942, Annals Ent. Soc. Am., 1943, P. C. Jour. Ent. & Zool.

No new distribution records can be added to the published account of this variable, but some diagnostic features should be elucidated. Size within the confines of typical *costatus* varies from 10 mm. to 15 mm. (including both sexes), and color ranges of living mature material are from jet black to a weak purplish-brown, with the teneral light brown commonly met in the field. Pronotal reticulation varies from fine and evenly-spaced to large and irregular. The posterior pronotal margin is evident on most specimens unless the foveation is extreme, when the marked crenulations and buckling of the pronotal dorsum invade and destroy the continuity of the margin. In these cases, the reticulum is markedly elevated above the plane of the side pronotal margins, which are relatively smooth and flat, as a

plateau above the surrounding plain. A marked, but never complete, breaking down of the intervening reticula between the foveae is noted in many of these extreme specimens. Generally, the sinuosity of the pronotal marginal outlines is gently and progressively curved, but some of the extreme forms evince the more marked outlines characteristic of an occasional *tuberculatus* and of the lone specimen upon which *vandykei* is based, but these lack the complete marginal serration of *vandykei—tuberculatus*.

Trogloderus costatus nevadus La Rivers

Trogloderus nevadus La Rivers, 1942, Annals Ent. Soc. Am., December 4/35: 437–440, 1943, P. C. Jour. Ent. & Zool.

There is no additional distributional datum to be added to the northern forms. The length variation is from 8 mm. to 11 mm., averaging considerably less than *costatus*. The purplish-brown color is much more common than in *costatus*, but black specimens are not rare; the teneral light brown often predominates in many sandy localities where *nevadus* is the only form present. All specimens of *nevadus* examined possess well-defined posterior pronotal borders, and the reticulations are, almost without exception, small and regular, in consequence of which the cross-sectional view of the pronotal dorsum shows a smoothly-curved outline, and appears nearly flattened from above, in contrast to the generally roughly-broken *costatus* pronotum. Nearly all specimens are consistent in the possession of a suggestion of the two distinct median foveae of *costatus* and *tuberculatus*, either as faint depressions caused by a lowering of the reticule walls, or as a widening at front and rear of the narrow median furrow.

Among the California Academy of Sciences specimens recently examined are four I am referring to *nevadus* on the basis of pronotal structure, but which are considerably larger than the average of the specimens hitherto known under the name. The largest of these reaches 15 mm., the maximum of *costatus*, and all are jet black. All came from southern California: Kern County (Randsburg, 5/IV/27, el. 2,500 ft., Thos. Craig), San Bernardino County (Yermo, 9/VI/40, el. 2,100 ft., W. F.

Barr & K. S. Hagen). The author is only generally familiar with the Randsburg locale, but spent a month collecting in the Yermo region, which contains considerable areas of sand dunes and sandy soils, from which these specimens seem to have come; these are similar to typical *nevadus* habitats in Nevada. In fact, the form is known only from such environs. While there is yet little of a concrete nature to bulwark the supposition, it may be that these specimens represent a southern variable in the process of formation, for they are incongruous when assembled with the northern specimens.

Trogloderus costatus vandykei n. subsp.

The jet-black variable is described from a single specimen in the collection of the California Academy of Sciences, taken by Dr. E. C. Van Dyke in San Bernardino County (Baker, 22/V/25, el. 920 ft.). While more material will be needed to evaluate finally the form's position in the complex, the fact that no further specimens have been taken in the 20 years since its initial discovery makes it necessary to utilize this unique in completing a survey of the entire group. Of all the specimens so far unearthed, this alone seems to combine elements of all the other known forms. The conspectus is that of the genus, which has been admirably given by Blaisdell (1909), and the differential diagnostic features are mentioned below. It differs from most other variables in (1) possessing reticulations over the center dorsum of the pronotum and tubercles along the lateral margins, thus suggesting the affinities between *costatus* and *tuberculatus*, and (2) carrying distinct serrations the entire distance of its lateral pronotal margins, which margins in turn are distinctively sinuate, flaring out in a pronounced bulge near its caudad end before bending back sharply to end at the posterior pronotal collar. This pronounced sinuosity plus the entire serrations is found only in *vandykei* and some *tuberculatus*, although, as mentioned, some extreme *costatus* show a similar sinuosity, in which case the posterior half of the lateral edge producing the sinuosity is smooth and free of serrations; in most *nevadus*, and many *costatus*, serrations are common the entire lateral edge of the pronotum, but the sinuosity in these is naturally symmetrical in the manner of an unstrung bow, bulging evenly in the middle,

and tapering gently on either side. In this set of characters in *vandykei* can be seen obvious ties between *costatus* and *nevadus*.

Vandykei possesses a shallow median pronotal furrow as in *nevadus*, with a mild but noticeable widening at the posterior end, an incipient fovea. Although *vandykei* has a relatively smooth pronotal surface, as does *nevadus*, unlike the rough dorsum of *costatus*, in cross-section it differs from *nevadus* in exhibiting a bilobed appearance due to two parallel, rounded ridges lying in the center of the disc on each side of the median furrow, whereas in *nevadus*, such a section presents a smooth curve across the center. *Vandykei* also resembles *nevadus* in the relative smoothness of the elytra between their conspicuous costae, both lacking the pronounced cross-ridging usually present in *costatus* and *tuberculatus*. These cross-ridges, however, even when strongest, never compare in height with the costae themselves. Another feature shared between *vandykei* and *nevadus* is the near obliteration of the median elytral costa, especially in the anterior half; this is generally well-developed in *costatus* and slightly less so in *tuberculatus*.

The following table will serve to formulate these differences more fully:

	T. c. costatus	*T. c. nevadus*	*T. c. vandykei*	*T. c. tuberculatus*
Tuberculations on pronotum	none to faintly on extreme lateral margins	same as *costatus*	on lateral margins only	entire pronotum
Serrations on pronotal edges	complete to incomplete	complete	complete	complete
Sinuosity of pronotal edges	regular to irregular	regular	irregular	regular to irregular
Median elytral costa	prominent	repressed	repressed	prominent
Pronotal median fovae	prominent distinct and separated	obsolescent	obsolescent	prominent distinct and generally separated
Elytral Intra costate ridging	pronounced	repressed	repressed	pronounced

Trogloderus costatus tuberculatus Blaisdell

Trogloderus tuberculatus Blaisdell, 1909, U. S. N. M. Bull. 63: 490–492, pl. 6, fig. 14.
Trogloderus tuberculatus La Rivers, 1942, Annals Ent. Soc. Am.

There is little to be added to what is already known of this variant. It rivals *costatus* in size, and has been diagnostically delineated in the preceding discussions. However, one of the California Academy specimens shows considerable foveal obliteration and coalescence, approaching *nevadus* in this detail; all other specimens seen have possessed deep, distinct foveae resembling those of *costatus*.

In conclusion, it may be said that *tuberculatus* is perhaps the most distinctive and readily-differentiated subspecies of the entire group, and *vandykei* with its partial tuberculation indicates the affinities of *tuberculatus* with the remainder of the *costatus* complex. At the present state of our knowledge of the species, *costatus* is a variable compounding of four recognizable entities and probably others, as yet unknown and undescribed, whose eventual appearance will undoubtedly be of aid in resolving the problem of relationships. Complete solution, however, will depend, in the author's opinion, on a thorough study of larval and pupal chaetotaxy. Many groups of tenebrionids show similar tendencies, particularly the Eleodiini and Coniontini within the author's experience, in which the immature forms possess differential characters completely lost in the adults; even genitalia fail miserably in attempts to analyse satisfactorily the differences between many adults of *Eleodes* and *Coniontis*, and the *Trogloderi*, like certain other Eleodiini, have a generalized type of genital construction which possesses no adequate specific diagnostic characters.

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Texas Lepidoptera (Rhopalocera: Papilionoidea)

By Don B. Stallings and J. R. Turner, Caldwell, Kansas

When H. A. Freeman moved to Pharr, Texas in 1944, he immediately began to make some remarkable catches of butterflies in that vicinity.* From the butterflies caught at Pharr and the surrounding territory we are of the opinion that this area of the Rio Grande Valley is in the Tropical Zone (the same as Southern Florida) rather than in the Lower Austral Zone. Late life zone maps of North America do not indicate this area to be tropical; however, the life zone map by C. Hart Merriam corrected to Dec. 1897 as published in Bulletin No. 10, U. S. Dept. of Agric., Division of Biological Survey, 1898, shows this area to be tropical. There are other indications which tend to prove this to be true.

Mr. Freeman's interests are chiefly with the skippers (Hesperioidea) and hence he has passed on to us for determination most of the other Rhopalocera. In addition he has contacted several other collectors in the vicinity, all of whom have been most generous with their finest specimens. In as much as a number of these represent new records for the United States, some of which are native, we asked Dr. Wm. P. Comstock of the American Museum of Natural History to check our determinations. We wish to give our thanks for his valuable assistance.

Since many collectors will want references to these new records we have given some data on the literature. To save space we will refer to "Macro-Lepidoptera of the World,"

* See also Ent. News, vol. LVI, No. 1, p. 4, and Ent. News, vol. LVI, No. 4, p. 102.